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ABSTRACT

A study was conducted to examine the data collected by previous researchers on the degree of helpfulness of natural contexts. In this study two schemes of context cue types were compared on the basis of their contribution to word meaning acquisition, and their relationship to other text and word properties was explored. Subjects were 352 children (third, fifth, and seventh graders) who had served as subjects in previous research. All texts were taken from grade-level books and were classified as easy or hard texts based on judgments of how familiar the topic was for each group. There were two narrative texts and two expository texts assigned to each grade level. From each text, the most difficult words were selected as target words. Each context cue category was analyzed by two judges and each target word was analyzed in two ways. Although there were no significant main effects, the results indicated that strength and explicitness of cues interacted significantly with other text and word factors. Findings imply that the relevant question might not be whether presence and strength of such cues contribute to word learning from context, but instead, what the conditions are under which a reader would be more likely to utilize any cues present to infer the meaning of an unknown word. (Four figures and 12 tables of data are included and 19 references are attached.) (MG)

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Technical Report No. 531

THE ROLE OF CONTEXTUAL INFORMATION IN WORD MEANING ACQUISITION DURING NORMAL READING

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Abstract

A secondary analysis of the data collected by Nagy, Anderson, and Herman (1987) was conducted to examine the effects of contextual information in the acquisition of word meanings during reading. The context of unfamiliar words embedded within grade-appropriate texts was analyzed as to the amount and explicitness of context cues present. The context cue categories proposed by Ames (1966) and those proposed by Sternberg and Powell (1983) were utilized. Measures representing the strength of Ames's cues emerged as more consistent predictors of learning from context across grades, texts, and words than did measures representing Sternberg and Powell's cues and general contextual support factors. Although there were no significant main effects, the results indicated that strength and explicitness of cues interacted significantly with other text and word factors. The findings are discussed with respect to these significant interactions.

THE ROLE OF CONTEXTUAL INFORMATION IN WORD MEANING ACQUISITION DURING NORMAL READING

The role context plays in the incidental acquisition of word meanings has been increasingly recognized as an important one in the area of vocabulary research and instruction. That context contributes to vocabulary learning has intuitively made sense to and has been taken for granted by educators (Beck, McKeown, & McCaslin, 1983). Problems with certain aspects and outcomes of direct explicit instruction of word meanings have sparked in researchers a renewed interest in investigating word meaning acquisition from context.

For example, direct instruction that includes methods such as providing definitions, synonyms, and labeled examples is an effective method of instruction but not an efficient one. Direct instruction has the potential of providing much needed instruction in word meanings that would be difficult to acquire from other sources or independently, in making explicit conceptual attributes and relationships that underlie word meanings, and in the use of dictionary definitions (Graves, 1987; Miller & Gildea, 1987; Nagy, 1988). But such instruction is inherently slow and cannot be expected to account for most of the volume of word learning that takes place (Nagy & Anderson, 1984; Nagy & Herman, 1987). Related to the problem of the amount of vocabulary that can be taught directly is the problem of the quality of word knowledge that can be imparted. These two aspects are complementary in the sense that if the focus of direct instruction is on either quality or quantity of knowledge, it will be at the expense of the other. Such considerations have led Nagy and Herman (1987) to argue that explicit instruction fails for the most part to produce in-depth word knowledge. More specifically, Mezynski (1983) has argued that direct instruction cannot be expected to cover the various meanings of polysemous words or the several shades of meaning that most words assume in different contexts. Therefore, the case has been made that what is needed is instruction to help students become independent word learners (Nagy, Anderson, & Herman, 1987; Nagy, Herman, & Anderson, 1985).

One way of pursuing such a goal is to examine the effect of context in word meaning acquisition. The relevant questions to be answered are whether children can take advantage of contextual information, whether they do so spontaneously, and what factors play a role in vocabulary acquisition from context. The findings of such research could serve as the basis for the design of strategic instruction whose objective would be to foster independent and effective use of context for word learning purposes. A number of studies have shown that both younger and older students can form a notion of a word's meaning when it is presented in a series of context sentences (McKeown, 1985; van Daalen-Kapteijns & Elshout-Mohr, 1981; Werner & Kaplan, 1952). These studies have all identified ability as an important determinant of whether contextual information will be used effectively. But because the contexts used in the studies were composed of a series of sentences designed to provide various pieces of information about a given word, such findings do not necessarily imply that context will be used spontaneously and in the same way in the course of normal reading.

Jenkins, Stein, and Wysocki (1984) studied word learning from context in a more natural reading situation. Unfamiliar words were introduced in paragraphs written around a central concept. Even though the effects of word learning were found to be small, fifth-grade students did acquire some word meanings from context without explicit directions to do so. The factors that were varied in the study and showed to have an effect in learning from context were (a) frequency of occurrence of the target word (i.e., the number of context presentations); (b) prior exposure to the words in the form of low-intensity, informal instruction; and (c) reading ability. Even though Jenkins et al. attempted to simulate a more natural reading situation, the paragraphs were written specifically to incorporate the target words and represented informative contexts.

Beck et al. (1983) argued that most of the natural contexts one encounters during normal reading are not explicitly designed to convey word meanings and vary in a continuum from being very helpful to being misleading. To account for this, Nagy, Herman, and Anderson (1985) investigated whether students acquire measurable knowledge about unfamiliar words while reading natural texts. Eighth-grade students were randomly assigned to read either a narrative or an expository text. The subjects were interviewed individually about the meanings of the target words, and then were given a multiple-choice test designed to measure degrees of word knowledge. The results indicated small but statistically significant gains in word knowledge from context.

In a subsequent study, Nagy, Anderson, and Herman (1987) collected data on a fairly large number of school-age children and explored a large number of person, text, and word variables. The subjects represented three grade levels (third, fifth, and seventh), as well as a range of reading ability levels. Text variables included (a) the genre of text (narrative or exposition); (b) the difficulty of the text, based on text-level word familiarity and difficulty; (c) the overall story conceptual difficulty as measured by the proportion of conceptually difficult words in a given text; and (d) the strength of contextual support. The strength of contextual support was evaluated by four trained raters, and the ratings reflected the extent to which a reader not familiar with the meaning of the target word would be able to infer its meaning from context.

Nagy et al. (1987) also explored a number of variables reflecting word properties. These included (a) the level of word difficulty, or learning situation; (b) the part of speech; (c) the word's conceptual category; (d) the morphological transparency; (e) the frequency of a word's occurrence in the text; and (f) the length of the word in syllables. The measures of word difficulty (learning situation) were based on category systems developed by Jenkins and Dixon (1983) and Graves (1984), in which the critical dimension is whether the learner already knows the concept with which the word to be learned is associated. The word difficulty variable included four levels ranging from the easiest to the hardest level. Level 1 included words for which a concept and a synonym are known. Level 2 included words for which a concept, but not a synonym, is known. Level 3 included words for which a concept is not known but could be acquired on the basis of knowledge already available to the reader. Level 4 included words for which a concept is not known and learning it requires the acquisition of new factual information, or learning a related system of concepts. The word conceptual category variable consisted of four categories: Category 1 included words representing a concrete entity; Category 2 included words representing a concrete event; Category 3 included words representing an abstract event; and Category 4 included words representing abstract, complex entities.

The subjects were randomly assigned to read either the narrative or the expository texts designated for the appropriate grade level. Each subject read only two of the four texts at his or her grade level, but was tested on the target words from all four texts. Prior to reading the texts, the subjects were given a checklist vocabulary test the purpose of which was to control for variation among subjects in prior knowledge. The scores on words from the passages that were not read were also included in the analyses to determine the gain that could be attributed to learning from context and to provide supplementary control for prior knowledge differences. The results indicated that there was a small but significant effect of learning from context. It was found that the subjects who had read a text knew 3.3% more of the difficult words it contained than did the subjects who had not read the text. The results further indicated that learning from context was affected by the average length of a word in syllables, the passage-level conceptual difficulty, and the target word's conceptual difficulty. With respect to this last factor, it was found that there was no learning from context for words at the highest level of conceptual difficulty.

Herman, Anderson, Pearson, and Nagy (1987) specifically explored the role that text factors might play in learning word meanings from context. The overall purpose of their study was to investigate how

expositions that systematically vary in the quality of text features affect a reader's incidental acquisition of vocabulary knowledge. The results indicated that eighth graders who had read the text knew more word meanings than did students who had not. More importantly, results showed that students who had read a conceptually elaborated version that (a) provided a more thorough description of important concepts, (b) explained interrelations more clearly, and (c) gave typical examples of concepts that were unlikely to be known by the students gained more in word knowledge than did students who read the original text.

The overall picture, then, indicates that children not only can take advantage of context in word learning tasks, but that they also can use context spontaneously while reading, and that a number of factors have an effect. A factor that has not been adequately explored is context itself, that is, how variation in the degree of helpfulness and quality of the information provided in natural contexts can affect word learning. Although context characteristics could be incorporated within the more general text factors investigated by Herman et al. (1987), context nevertheless represents a distinct aspect in the sense that it refers to the characteristics of the context that are relevant for a specific word and not to the overall text characteristics.

This study represents a secondary analysis of the Nagy et al. (1987) data, undertaken to examine the degree of helpfulness of natural contexts, that is, the quality and quantity of information they provide concerning the meaning of a word, how this information affects the degree of word learning from context that may take place, and whether context interacts with other influential factors. So, the first objective of this study was to explore the kinds of contextual information that natural texts provide with respect to specific words that have been judged as unknown. For this purpose, the two major classification schemes of context cues developed by Ames (1966) and Sternberg and Powell (1983) were used to analyze context and to code the information provided (Tables 1 and 2). The 14 context cue categories proposed by Ames (1966) and the 8 cue categories proposed by Sternberg and Powell (1983) were analyzed according to the guidelines given by the original authors and on the basis of the examples provided by Ames.

[Insert Tables 1 and 2 about here.]

In this study the two schemes of context cue types were compared on the basis of their contribution to word meaning acquisition, and their relationship to other text and word properties was explored. The variables explored and the materials used were the same as in the Nagy et al. (1987) study.

For the purposes of this study, four additional variables were created to account for contextual information as specified by Ames and by Sternberg and Powell. The context for each word, taken from the pool of target words in the Nagy et al. study, was analyzed according to the presence or absence of the cue category types proposed by Ames and by Sternberg and Powell. The number of cue types from both classification systems that were found present for each word were added yielding two presence or absence scores, one accounting for Ames's cue types and a second one accounting for Sternberg and Powell's cue types. When a given cue was found present, the context was further analyzed to determine the strength of that cue on the basis of how helpful the information included in the cue would be to readers in terms of guiding them to the appropriate inferences regarding the target word's meaning. This analysis also yielded two scores for each word, one reflecting the strength of Ames's cue types, and a second score reflecting the strength of Sternberg and Powell's cue types that were found present in the text.

All of the above contextual information variables are considered to be highly related to the strength of contextual support factor that was explored in the Nagy et al. (1987) study. Nagy et al. have proposed that strength of contextual support can be taken as the sum of the various more specific types of

contextual cues, categories for which have been suggested by Ames and Sternberg and Powell. Therefore, the contextual information variables that were examined in the present study can be thought of as augmenting the strength of contextual support factor by providing a more fine-grained analysis of the information provided by the context. Although the strength of contextual support variable was not found to interact with learning from context (Nagy et al., 1987), it was expected that the four contextual information variables examined would interact with learning from context on the basis that they reflect a more specific and detailed representation of contextual support.

Method

Subjects

The data on 352 children who served as subjects in the Nagy et al. (1987) experiment were used in this study as well. There were 129 children in third grade, 85 children in fifth grade, and 138 children in seventh grade. The subjects' percentile scores from the Vocabulary and Reading Comprehension Subscales of the SRA Achievement Series (1978) were included, with each grade representing a range of ability.

Materials

The materials used in this study were the same materials used in the Nagy et al. study. All texts were taken from grade-level books and were classified as easy or hard texts based on judgments of how familiar the topic was for each group. There were two narrative texts and two expository texts assigned to each grade level, and all texts were of comparable length.

From each text, the most difficult words were selected as target words. The words in the list were subsequently rated for difficulty level by experienced teachers. Only words nominated by all raters, or in some cases, by the majority of raters, were included in the final list of target words (Nagy, et al., 1987).

Procedures

Each context cue category was analyzed by two judges according to the guidelines and the examples given by Ames and by Sternberg and Powell. Each cue category was operationalized according to the types of text information that would be included under that particular cue category. Although the procedure for this analysis was faithful to the original guidelines proposed by Ames and by Sternberg and Powell, in some instances it was found necessary to extend the application of the cues to include text information that was not explicitly accounted for by Ames and by Sternberg and Powell but was judged to be logically consistent with the definition of each cue category.

Each target word was analyzed in two ways. First, a word received a score indicating the presence or absence of each cue type included in both the Sternberg and Powell and the Ames classification systems. A score of 0 indicated that the particular cue type did not apply for a given word, while a score of 1 indicated that the particular cue type was present in the context and could potentially be used by the reader to infer the meaning of the target word. The goal for this analysis was to find as many cue types that applied in each case, that is, all of the cues that contained some piece of information pertaining to the meaning of the target word. In the case of a word occurring more than once in a passage, the sum of the cues found to apply in each occurrence was taken to represent the total number of cues found present in the text for that particular word. The above analysis yielded two variables: (a) the total number of cue types included in Ames's classification system, and (b) the total number of cue types

proposed by Sternberg and Powell that were found present in the context and applying to each particular word.

A second analysis was undertaken to assess the strength and potential usefulness of the cues that were found present in the context for each target word. A score of 1 indicated that a particular cue was present but weak, implicit, and far from the target word in terms of location in the text. A score of 2 indicated that the cue was not only present but also strong, explicit, and close to the target word. The rationale for this second analysis was that not all cue types found present contributed equally to word learning from context. Some of the cues were too implicit in the text and required extensive inferencing on the part of the reader, while others were too far from the target word and, therefore, required that the reader either keep the information active in memory or go back and reread part of the text. This analysis yielded two more contextual information variables: (a) the total rating of strength of Ames's cue types, and (b) the total rating of strength of Sternberg and Powell's cue types found present in the context for each target word.

Two texts, one expository and one narrative, were selected at random to be analyzed by a second judge to investigate the interrater reliability of the cue operationalization scheme that was utilized. The number of cue types indicated as present for each word by each judge served as the basis for the reliability analysis. Any differences were resolved in conferences. The maximum reliability coefficients found for the Ames cue analysis were $r = .35$ for the expository text and $r = .48$ for the narrative text. The maximum reliability coefficients achieved for the Sternberg and Powell cue analysis were $r = .51$ for the expository text and $r = .46$ for the narrative text. The four contextual information variables that resulted from the above analysis were examined in connection with the text and word variables that were included in the Nagy et al. study.

Design and Analysis

Of primary interest was the contribution of the contextual information variables, that is, the number of Ames's and Sternberg and Powell's cue types present in the context for each word as well as their ratings of strength, to word learning from context. In addition, the interactions between the contextual information variables and any word and text variables were also examined. The analyses followed the logic of mixed analysis of variance, where the unit of analysis was the target word, and the dependent variable was the posttest mean score on the words read. Stepwise regression procedures were followed in order to control for and remove the effects of prior knowledge and other text and word variables that might confound the magnitude of the effects associated with the contextual information variables.

Results

A preliminary analysis indicated that the posttest mean scores on words read variable was highly and significantly correlated with the posttest mean scores on words not read variable, $r = .9115$, $p < .001$. Posttest mean scores on words read also correlated significantly with pretest mean scores, $r = .6794$, $p < .001$. All of the contextual information variables were significantly interrelated, $p < .001$, and correlated significantly with strength of contextual support. An examination of residual plots, derived from simple regression analyses, indicated heteroscedasticity of variance with respect to the four contextual information variables. A square-root transformation of these variables resulted in normalizing the data, and, therefore, the transformed values were used in all subsequent analyses.

The total number of Ames's cues present, total number of Sternberg and Powell's cues present, total ratings of strength of Ames's cues, and total ratings of strength of Sternberg and Powell's cues were entered into stepwise regression equations. Posttest mean scores on words not read, text difficulty,

genre of text, story conceptual difficulty, and learning situation, as indicated by word conceptual difficulty, were entered first in order to remove any variance attributed to these variables. The rationale for conducting this analysis was based on findings concerning the significance of these variables in the Nagy et al. study. The variable posttest mean scores on words not read was taken to account for variance associated with the effects of prior knowledge. In addition, by entering it first, posttest mean scores on words not read was also taken to account for the difference between posttest mean scores on words read and on words not read that could be attributed to learning from context. None of the contextual information variables were found to be significant, $p > .10$. But when the contextual information variables were entered after posttest mean scores on words not read and text difficulty, in that order, the total ratings of strength of Ames's cues was significant, $F = 8.7649$ (1, 211), $p < .01$.

Because it was hypothesized that the total ratings of strength of Ames's cues variable might mask the effects of the other three contextual information variables, separate stepwise regression analyses were performed in which posttest mean scores on words not read was the first variable entered, text difficulty the second variable entered, and then each of the four contextual information variables was entered separately. This analysis indicated that all of the four contextual information variables was significant, $p < .05$.

To rule out curvilinearity, separate stepwise regression analyses in a forward selection manner were again performed in a similar manner, with the exception that after each contextual information variable, the square of that variable was also entered to test for linearity and to explore any floor or ceiling effects. None of the squared variables approached significance, $p > .10$, and, therefore, the hypothesis that the contextual information variables might show a curvilinear function was rejected.

At this point, stepwise regressions within the framework of blockwise selection were performed to explore the relationships among all the variables in the study, to validate the analysis up to this point, and to provide guidance for subsequent analysis. Prior knowledge, as reflected by posttest mean scores on words not read, was entered first in a block by itself, followed by the person variables, comprehension ability, and grade, comprising the second block. The third, fourth, and fifth blocks represented the text, word, and context cue variables respectively. Finally, the interactions between the context variables and other variables comprised the sixth and final block. The significant predictors of each block were entered first before the predictors included in each subsequent block.

The only variables that emerged from this analysis as highly and consistently significant were posttest mean scores on words not read, text difficulty, and the two-way interactions between total ratings of strength of Ames's cues and learning situation or word conceptual difficulty and between total ratings of strength of Ames's cues and word conceptual category (see Table 3).

[Insert Table 3 about here.]

Although story conceptual difficulty was a significant predictor at the initial stages of the procedure, the effects of that variable were masked by the significant interactions in the last step of the analysis. Regarding the significant interaction between total ratings of strength of Ames's cues and learning situation, it can be seen from Table 4 and Figure 1 that, although a high rating of strength has a negative effect on the learning of words representing Levels 2 and 4, it has a positive effect on the learning of words belonging into Levels 1 and 3. It will be recalled that Level 1 includes words for which a concept and a synonym are known, while Level 3 includes words for which a concept is not known but which could be acquired on the basis of knowledge already available to the learner. On the other hand, Level 2 represents words for which the concept, but not a synonym, is known, while Level

4 includes words for which the concept is unknown and the factual information necessary for learning it is unavailable to the reader.

[Insert Table 4 and Figure 1 about here.]

Turning now to the significant interaction between total ratings of strength of Ames's cues and the word conceptual category, it can be seen from Table 5 and Figure 2 that a high rating of strength has a positive effect in the learning of words belonging in Categories 2 and 4. Category 2 includes words representing concrete events, while Category 4 includes words representing abstract complex entities. Rating of strength appears to have almost no effect on the learning of words representing concrete entities (Category 1) and a negative effect on the learning of words representing abstract events (Category 3).

[Insert Table 5 and Figure 2 about here.]

Despite the absence of any significant interactions involving grade, the same blockwise selection analysis was repeated within grade levels. An examination of Tables 6, 7, and 8 indicates that a different pattern of results emerged. In Grade 3, aside from prior knowledge, the genre of text is the other significant predictor of learning from context (Table 6). There appeared to be more learning of words from context with expository texts, M = .4497, than with narrative texts, M = .3187.

[Insert Table 6 about here.]

In Grade 5, text difficulty and the interaction between total ratings of strength of Ames's cues and part of speech reached significance (Table 7).

[Insert Table 7 about here.]

It can be seen from Table 9 and Figure 3 that, while strong and explicit cues are helpful in the learning of nouns, they have a negative influence on the learning of verbs and adjectives. Adverbs and prepositions or conjunctions were excluded from the analysis, because there were few target words representing these parts of speech (N = 3) in the Grade 5 texts.

[Insert Table 9 and Figure 3 about here.]

In Grade 7, only the interaction of total ratings of strength of Sternberg and Powell's cues with genre of text, along with prior knowledge, achieve significance (Table 8).

[Insert Table 8 about here.]

It appears that while strong and explicit cues have a small positive effect on the learning of words in expository texts, their influence is a negative one when the words to be learned are found within narrative texts (see Table 10 and Figure 4). With low ratings of strength of such cues there is more learning of words within narrative texts than within expository texts.

[Insert Table 10 and Figure 4 about here.]

The initial stepwise regression analysis with posttest mean scores on words not read, text difficulty, and the contextual information variables was repeated within the different grade groups to examine any differential effects. The results are summarized in Table 11.

[Insert Table 11 about here.]

It can be seen that total ratings of strength of Sternberg and Powell's cues reached the level of significance only in Grade 7. But the regression coefficient associated with this variable is negative and the variance that it accounts for cannot be considered meaningful. This is not a surprising result in light of the significant interaction between ratings of strength of Sternberg and Powell's cues and genre of text, which indicated that the negative effect of high ratings on learning words from narrative texts is stronger than the positive effect this variable has on the learning of words from expository texts (Table 10, Figure 4).

It is worthwhile to note here the discrepancy between the overall analysis where the total ratings of strength of Ames's cues emerged as the only significant predictor and the within-group analysis. It will be recalled that there are high intercorrelations among the contextual information variables that are essentially different measures of the same factor. Therefore, it must be assumed that when a variable emerges as significant, it carries with it, or masks the effects of the other cue variables as well. This argument was substantiated in a subsequent analysis where only the total ratings of strength of Ames's cues variable was allowed to enter after posttest mean scores on words not read and text difficulty. The pattern of results was identical with that of the previous analysis (Table 11), with the exception that the total ratings of strength of Ames's cues emerged as the significant predictor in Grade 7, $F = 9.3611$ (1, 75), $p < .01$, in the place of total rating of strength of Sternberg and Powell's cues. Also, the case might be that even though the total ratings of strength of Sternberg and Powell's cues reaches significance in Grade 7, the effects of total ratings of strength of Ames's cues are more evenly distributed across grade levels, but not strong enough to appear as statistically significant.

On the basis of the above results, it was hypothesized that different cue types might have differential effects in learning from context because of inherent variation in their degree of helpfulness. Preliminary correlational analysis indicated that the ratings of a number of cues in each system were significantly related with the ratings of other cues in the same and/or in the other system. In addition, when posttest mean scores on words not read was partialled out, more than half of all the cue types correlated negatively with the dependent variable, posttest mean scores on words read.

When all the grade groups were pooled together, no significant positive correlations were observed between any individual cues and the dependent variable. But when partial correlational analysis was repeated within groups of grade and comprehension ability, that was nested within grade, a number of Ames's cue categories--Question/Answer Pattern of Paragraph Organization, Modifying Clauses, and Comparison/Contrast--and one Sternberg and Powell's cue category--Equivalence--were found to be positively and significantly related to posttest mean scores on words read in specific groups (Table 12). The same analysis in levels of Word Conceptual Difficulty indicated that one Ames's cue category, Cause and Effect Pattern, correlated positively and significantly, $r = .3405$, $p = .0145$ ($N = 52$) with the dependent variable and only for words representing the highest level of conceptual difficulty, that is, when the concept underlying the word is unknown and learning it would require the acquisition of new factual information.

[Insert Table 12 about here.]

Discussion

Although contextual cues appear to play a role in learning from context, such a statement needs to be qualified in a number of ways. On the basis of the present findings, it appears that prior word knowledge and the difficulty of the text are the primary determinants of whether learning of word

meanings from context will take place. The effects of contextual information depend on the interactions of these factors with other text and word variables, as well as on the grade and maturational level of the reader.

Of the four contextual information variables, the ones more likely to influence learning from context are those concerning the strength and explicitness of the contextual cues that can be found surrounding a word, and not those that merely reflect the amount in terms of the number of cues that can be found present. It will be recalled that ratings of strength and explicitness of cues are measures of first, how far in the text a given cue is from the target word, and second, the amount of inferencing or cognitive processing that would be required on the part of readers were they to use that cue for word learning purposes. Therefore, these measures can also be taken to indicate how helpful a given cue will be in pointing out the meaning or an aspect of the meaning of an unknown word.

The fact that only the strength and explicitness of the Ames cue types in context emerged as significant across grade levels when all of the cue variables were allowed to enter into the model signifies that this measure accounts best for learning from context in relation to the other measures of contextual information that were utilized in this study. The Ames system was formulated on the basis of experts' intuitions (thinking-aloud protocols), and included a high number of overlapping cue types ranging from local and concrete to more global and abstract. On the other hand, the Sternberg and Powell system included a smaller number of prespecified cues, which incorporated more local and concrete information that were also more tightly classified into categories than were the Ames cues. It might be hypothesized that the intuitions of expert word learners match more closely those of novices in the sense that novices are likely to rely on the same kind of information and are likely to attempt to perform similar cognitive operations as the experts but to a lesser extent. It might also be the case that the information in text pertaining to word meaning does not necessarily conform to prespecified, mutually exclusive categories, a possibility to which the qualitative analysis of text in this study points.

The ratings of strength of Ames's cues also appeared to mask the effects of the other contextual information measures including the more global measure of contextual support employed in the Nagy et al. (1987) study. All of the contextual information variables were highly and significantly interrelated, indicating that there is considerable overlap in the information they account for. The more global measure of contextual support was not found to have an effect in learning from context in the Nagy et al. study. This finding was replicated in the present study, thereby confirming the hypothesis that a contextual information factor constructed from a more objective and operationalizable cue category system would be a more potent predictor of word meaning acquisition from context. The high interrelationship found between the more specific contextual information variables employed in this study and the global contextual support measure, also confirms Nagy et al. hypothesis that the more global measure can be taken to reflect to some extent the sum of the more specific cue types that can be found in context. The strength and explicitness of Ames's context cues emerged as a significant predictor only when entered after prior knowledge and the difficulty of the text in the model. The contribution of this measure was no longer significant when other global text variables were included in the model. Specifically, it was found that strength of Ames's cue types is not significant if entered after variables such as story conceptual difficulty, genre of text, and the conceptual difficulty of the word. It can be supposed that these variables have the potential of masking the effects of any more specific measure of contextual information as indicated by the interactions that emerged as significant in this analysis.

One thing that is apparent in this study is that factors representing contextual information have contingent rather than independent effects on learning word meanings from context. That is to say, they appear to interact with several other factors, and moreover, the type and nature of these interactions may depend on grade level.

When the data are viewed as a whole, it can be seen that the presence of Ames's cues that are strong and explicit aid in the learning of words for which a concept and a synonym are known, and in the learning of words for which a concept is unknown but the necessary knowledge to acquire it is available to the learner. Because no such positive outcome was observed for words for which the concept but not the synonym is known or for words for which the concept is not known and the relevant knowledge is not available, it can be hypothesized that strong and explicit cues have the effect of activating appropriate synonyms for an unknown word or relevant knowledge upon which further inferencing can be based concerning the meaning of an unknown word. Moreover, the learning of words representing concrete events and abstract, complex entities is facilitated by the presence of strong and explicit Ames's cues. The same cannot be said for the learning of words representing concrete entities or abstract events.

When it comes to grade-specific findings, it appears that strength of context cues has no effect in Grade 3. Instead, the genre of text appears to influence learning from context for the youngest readers. Specifically, it was found that words embedded within expository texts were more likely to be learned from context to some degree than words embedded within narrative texts. Although this is an unexpected finding, it can be hypothesized that expository text intended for that grade level is specifically constructed to focus the reader's attention on vocabulary learning and that it attempts to exemplify the relations between concepts more fully and concretely. It must be added though that a variable such as genre of text has the potential of masking the effects of any context cue variables as mentioned above.

In Grade 5, aside from text difficulty, the interaction of ratings of strength of Ames's cues with part of speech also had a significant effect in learning words from context. It was shown that nouns are more likely to be learned given strong and explicit cues, while the opposite was true for verbs and adjectives. This finding confirmed the impression formed as a result of the preliminary qualitative analysis, namely that the cue types proposed by the two systems and the information they were designed to account for were geared more toward nouns than other classes of words. But the surprising aspect of this finding was that the presence of strong and explicit cues proved to be actually detrimental to the learning of verbs and adjectives, whereas cues of low strength and explicitness appeared to be more helpful. One way to attempt to explain this finding would be to suppose that strong and explicit cues represent multiple sources of information relevant to the meaning of the word, all of them strong enough to compete for memory space and with the potential of leading to processing overload. Another possibility though could be that the presence of strong contextual aids might indicate that the author knows that the word is difficult. That is to say, strong and explicit cues might represent the author's attempt to make the meaning of a particular word more transparent and/or inferable. What still remains unexplained though is the differential pattern of results concerning the nouns on the one hand and the verbs and the adjectives on the other.

Finally, in Grade 7, the significant interaction between the rating of strength of Sternberg and Powell's cues with genre of text indicated that while the strength of such cues has a positive effect on learning from context in expository text, it hindered such learning in narrative text. It could be hypothesized that expository text is specifically constructed to produce some kind of learning, and, therefore, the reader is alerted to the need to utilize information in the text or prior knowledge for learning words, concepts, or interrelated systems of concepts. If that is the case, then strong and explicit cues are readily picked up and utilized by the learner, while similar cues in narrative text if they were to be processed and utilized could potentially disrupt the flow of comprehension.

To summarize, while context cues were found to be helpful under certain circumstances and for different learners, they were also found to have the opposite effect in other cases. Context cues can hinder learning from context when the words in question are found in a narrative text, when the words are verbs and adjectives as opposed to nouns, and when a synonym or the necessary knowledge to acquire

the underlying concept of a word are not available. On the other hand, context cues appear to have a positive effect in acquiring the meaning of nouns in expository texts and in activating an appropriate synonym or relevant knowledge that could lead the reader to an appropriate inference regarding the meaning of a given word. This can also provide at least a partial explanation for the negative regression coefficients and partial correlations on the one hand and the insignificant, though positive, effects on the other. The negative influence of the context cues in certain cases could have depressed or masked the positive influence of such cues in other cases resulting in overall nonsignificant effects for such variables.

This hypothesis is confirmed and partly extended by the individual cue analysis which showed that ratings of strength of only three cue types proposed by Ames and of one proposed by Sternberg and Powell had significant and positive partial correlations at different grade and ability levels. It is interesting to note that Equivalence cues, one of Sternberg and Powell's cue categories, and Question/Answer Pattern of Paragraph Organization, one of Ames's categories, proved to be helpful for the youngest and less able learners. A paragraph organized around questions and answers is most explicit at signifying relationships among concepts and at providing explanations for these relationships. Such a textual organization might help alert the reader first, to the possibility that some concept/word is unknown, and second, that the pertinent information can be found within the text. On the other hand, the Equivalence category represents the most straightforward and explicit of cues such as definitions and synonyms, and, therefore, comprises a most directive context. For the higher grades it was found that more complex and abstract cue types, in terms of the kind of information that is incorporated and the cognitive operations required to render this information usable, were found to be helpful in learning words from context. These cues included information that can be found within modifying clauses and in text structures that follow a comparison/contrast format.

A final interesting finding concerned the positive contribution of Ames's Cause and Effect cue category to the learning of the most difficult words in terms of word conceptual category. These are words for which neither a concept is known nor the factual knowledge necessary for learning them is available, and for which no learning from context was found in the Nagy et al. (1987) study. Cause and Effect cues attempt to specify any causal relations that might exist between concepts and, therefore, might provide some initial grains of knowledge about the unknown concept by means of tying it causally to another concept that is known to some extent.

Conclusion

Although context cues included in the category schemes developed by Ames (1966) and by Sternberg and Powell (1983) deserve to be considered as contributors to word learning from context, the nature of their effects depends on other more global factors. Whether context cues will promote word learning from context is not simply a matter of their presence or absence or of their strength and directiveness in pointing out a possible meaning for a given word. Instead, their helpfulness appears to depend on the type of the word that is to be learned, the text within which the word and the cues are embedded, and the ability level of the reader.

The findings of this study imply that the relevant question might not be simply whether presence and strength of such cues contribute to word learning from context, but instead, what the conditions are under which a reader would be more likely to utilize any cues present to infer the meaning of an unknown word. A focus on presence and strength of context cues appears to promote a view of word learning from context as involving local processing disconnected from the flow of text comprehension. The particular model implied is that readers, upon recognizing a word as unknown, scan the surrounding context for any directly relevant information, which they then synthesize to arrive at a possible meaning for the word. The problem with such a model is that it makes no attempt to provide an explanation

regarding the basis upon which a piece of information will be judged as "relevant" and an inferred meaning as "possible." It can be supposed that outside the global context the whole text provides, almost any cue can contain relevant information, and almost any meaning can be plausible. But in the presence of constraints imposed by the text, the number of choices the reader faces can be expected to decrease considerably.

On the basis of the findings of this study, it can be hypothesized that context cues will aid learning from context when the goal of the reader is to learn, when the text structure supports such a goal, and when such cues are perceived as an integral part of the close-knit information network that underlies the text. Indirect support for the validity of this hypothesis comes from results showing that context cues interact with other text and word variables, and that the cues that appear to be helpful are not just cues that are direct and explicit but also cues that derive from the structure of the text, and cues that can be thought of as explanations of concepts and of their relationships to other concepts in the text.

Therefore, a more fruitful approach in the study of word learning from context would be to examine the factors that make the utilization of context in general, and of context cues in particular, possible. That is, there should be a shift in focus from whether the context provides cues as to the meaning of a word, to what are the conditions under which a reader is more likely to process contextual information to infer a word's meaning.

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Author Notes

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Table 1

Cue Categories Included in the Ames (1966) Classification Scheme of Contextual Information

1. Clues derived from language experience or familiar expressions
2. Clues utilizing modifying phrases or clauses
3. Clues utilizing definition or description
4. Clues provided through words connected or in series
5. Comparison or contrast clues
6. Synonym clues
7. Clues provided by the tone, setting, and mood of a selection
8. Referral clues
9. Association clues
10. Clues derived from the main idea and supporting details, and the overall pattern of paragraph organization
11. Clues provided through a question-answer pattern of paragraph organization
12. Preposition clues
13. Clues utilizing non-restrictive clauses or appositive phrases
14. Clues derived from the cause/effect pattern of sentence and paragraph organization

Table 2

Cue Categories Included in the Sternberg and Powell (1983) Classification Scheme of Contextual Information

1. Temporal cues
2. Spatial cues
3. Value cues
4. Stative descriptive cues
5. Functional descriptive cues
6. Causal-enablement cues
7. Class-membership cues
8. Equivalence cues

Table 3

Summary of Blockwise Selection for Posttest Mean Scores On Words Read

Variable Entered	Partial R**2	*F*	*Pr*>F
Posttest Mean Scores on Words Not Read	.8308	1031.33	.0001
Ratings of Strength of Ames's Cues X Learning Situation[a]	.0100	13.1215	.0004
Text Difficulty[b]	.0062	8.3768	.0042
Ratings of Strength of Ames's Cues X Word Conceptual Category[c]	.0031	4.3490	.0383

[a] Coded 1 for known concept and synonym; 2 for known concept only; 3 for unknown concept but available knowledge; 4 for unknown concept and unavailable knowledge.

[b] Coded +1 easy; -1 hard.

[c] Coded 1 for concrete entity; 2 for concrete event; 3 for abstract event; 4 for complex abstract entity.

Table 4

Posttest Mean Scores in Levels of Word Conceptual Difficulty/ Learning Situation and Ratings of Strength of Ames's Cues

	Ratings of Strength of Ames's Cues	
	Low[e]	High
LSIT 1[a]	.4127 (.3179)	.4844 (.3198)
LSIT 2[b]	.5186 (.3174)	.3587 (.2682)
LSIT 3[c]	.3079 (.2501)	.4076 (.2527)
LSIT 4[d]	.4643 (.2963)	.4161 (.2703)

Note. Standard deviations are in parentheses.

[a] Known concept and synonym.

[b] Known concept only.

[c] Unknown concept but available knowledge.

[d] Unknown concept and unavailable knowledge.

[e] Categories formed on the basis of the distribution around the mean.

Table 5

Posttest Mean Scores in Groups of Word Conceptual Category And Ratings of Strength of Ames's Cues

	Ratings of Strength of Ames's Cues	
	Low[e]	High
CCAT 1[a]	.4398 (.3373)	.4305 (.2584)
CCAT 2[b]	.4744 (.3168)	.5170 (.2772)
CCAT 3[c]	.3534 (.2504)	.2334 (.2060)
CCAT 4[d]	.3630 (.2665)	.5115 (.3030)

Note. Standard deviations are in parentheses.

[a] Concrete entities.

[b] Concrete events.

[c] Abstract events.

[d] Abstract complex entities.

[e] Categories formed on the basis of the distribution around the mean.

Table 6

Summary of Blockwise Selection in Grade 3

Variable Entered	Partial R**2	*F*	*Pr*>F
Posttest Mean Scores on Words Not Read	.8723	437.1829	.0001
Genre[a]	.0263	16.3624	.0001

Note. No other variables met the .05 significance level.

[a] Coded +1 narrative; -1 expository.

Table 7

Summary of Blockwise Selection in Grade 5

Variable Entered	Partial R**2	*F*	*Pr*>F
Posttest Mean Scores on Words Not Read	.6679	132.7069	.0001
Text Difficulty[a]	.0285	6.1051	.0161
Ratings of Strength of Ames's Cues X Part of Speech[b]	.0192	4.3251	.0416

[a] Coded +1 easy; -1 hard.

[b] Coded 1 nouns; 2 verbs; 3 adjectives; 4 adverbs; 5 prepositions/conjunctions.

Table 8

Summary of Blockwise Selection in Grade 7

Variables Entered	Partial R**2	*F*	*Pr*>F
Posttest Mean Scores on Words Not Read	.9247	933.3121	.0001
Ratings of Strength of Sternberg and Powell's Cues X Genre[a]	.0137	16.7198	.0001

[a] Coded +1 narrative; -1 expository.

Table 9

Posttest Mean Scores In Groups of Part of Speech and Ratings of Strength of Ames's Cues in Grade 5

	Ratings of Strength of Ames's Cues	
	Low[a]	High
Nouns	.3550 (.3159)	.5308 (.2468)
Verbs	.5289 (.2543)	.3840 (.1265)
Adjectives	.3940 (.2650)	.2105 (.2070)

Note. Standard deviations are in parentheses.

[a]Categories formed on the basis of the distribution around the mean.

Table 10

Postest Mean Scores in Groups of Genre and Ratings of Strength of Sternberg and Powell's Cues in Grade 7

	Ratings of Strength of Sternberg and Powell's Cues	
	Low[a]	High
Narrative	.4249 (.3349)	.1676 (.3218)
Expository	.4078 (.3186)	.4876 (.2429)

Note. The standard deviations are in parentheses.

[a] Categories formed on the basis of the distribution around the mean.

Table 11

Summary of Stepwise Regression Analyses for Posttest Mean Scores on Words Read within Groups of Grade

Grade	Variable Entered	B	Partial R**2	*F*	Pr>*F*
3	Posttest Mean Scores on Words Not Read	.9211	.8723	437.18	.0001
5	Posttest Mean Scores on Words Not Read	.8514	.6679	132.70	.0001
	Text Difficulty[a]	.0512	.0285	6.10	.0161
7	Posttest Mean Scores on Words Not Read	.9625	.9247	933.31	.0001
	Ratings of Strength of Sternberg and Powell's Cues	-.0062	.0098	11.28	.0012

Note. No other variables met the .05 significance level for entry into the models.

[a] Coded +1 easy; -1 hard.

Table 12

Significant Partial Correlations of Total Ratings of Strength of Cue Categories with Posttest Mean Scores on Words Not Read for Groups of Grade and Comprehension Ability

Group	*N*	Cue Category	*r*	*p*
Grade 3	66	Equivalence[a]	.3508	.0042
Grade 3/ Low Ability	32	Question/ Answer[b]	.3732	.0386
Grade 5/ High Ability	34	Modifying Clause[c]	.4476	.0090
Grade 7/ High Ability	42	Comparison/ Contrast[d]	.3148	.0450

Note. No other cue category met the .05 significance level.

[a] Sternberg and Powell (1983) cue category number 8.

[b] Ames (1966) cue category number 11.

[c] Ames (1966) cue category number 2.

[d] Ames (1966) cue category number 5.

Figure Captions

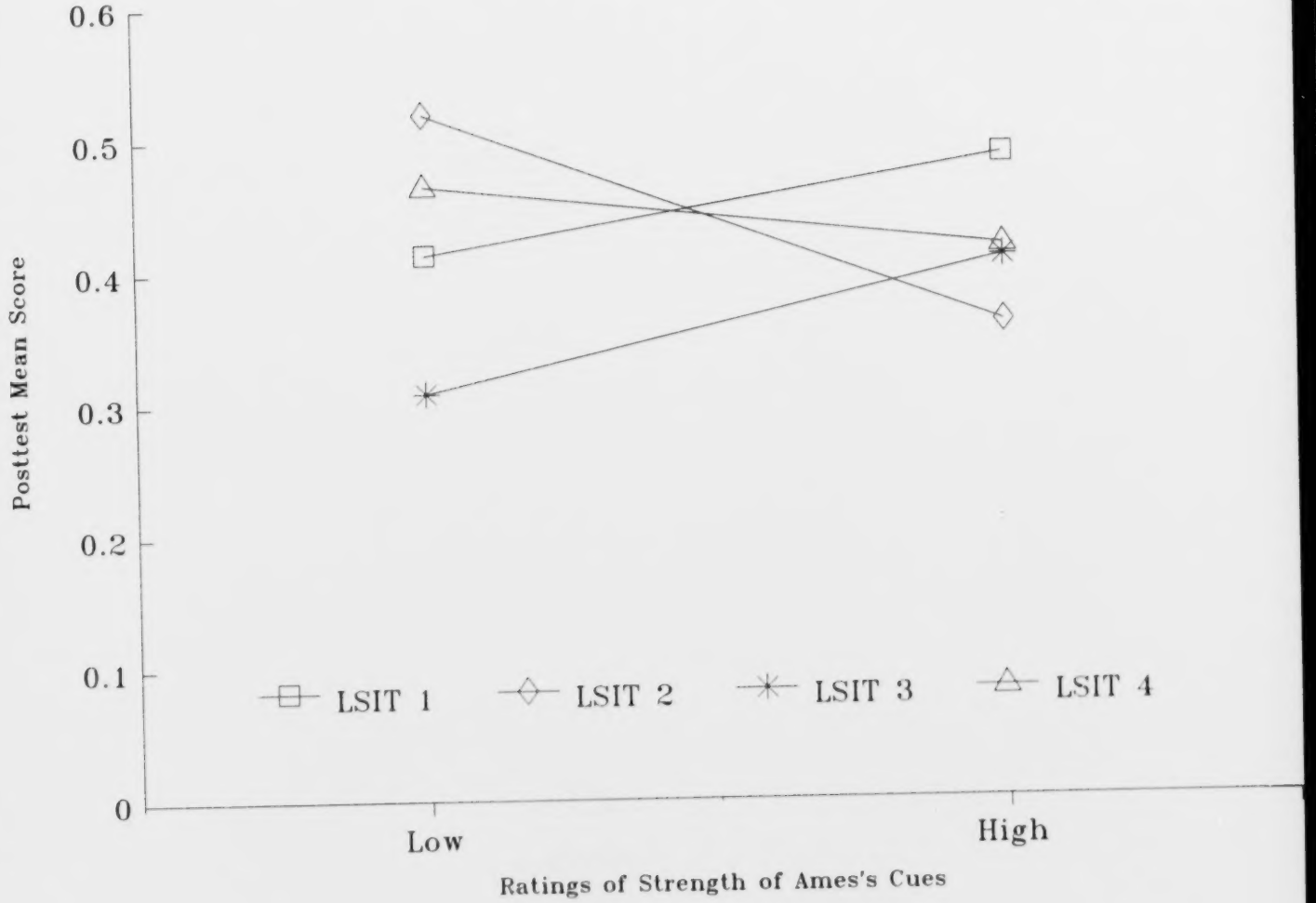
Figure 1. Posttest mean score as a function of word conceptual difficulty (learning situation) and ratings of strength of Ames's cues.

Figure 2. Posttest mean score as a function of word conceptual category and ratings of strength of Ames's cues.

Figure 3. Posttest mean score as a function of part of speech and ratings of strength of Ames's cues.

Figure 4. Posttest mean score as a function of genre of text and ratings of strength of Sternberg and Powell's cues.

Figure 1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Posttest Mean Score
LSIT 1
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LSIT 3
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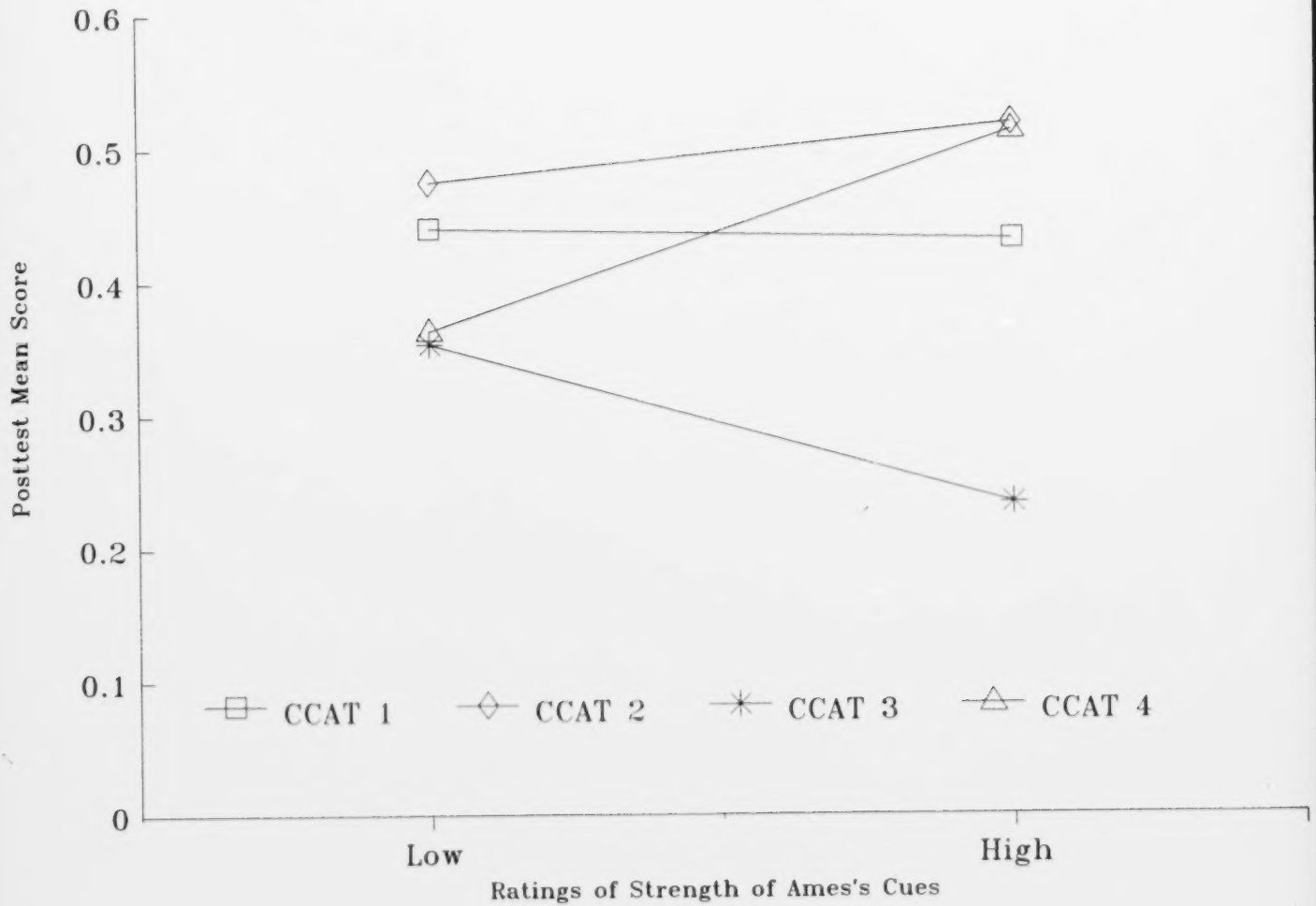
High
Ratings of Strength of Ames's Cues

Figure 2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Posttest Mean Score
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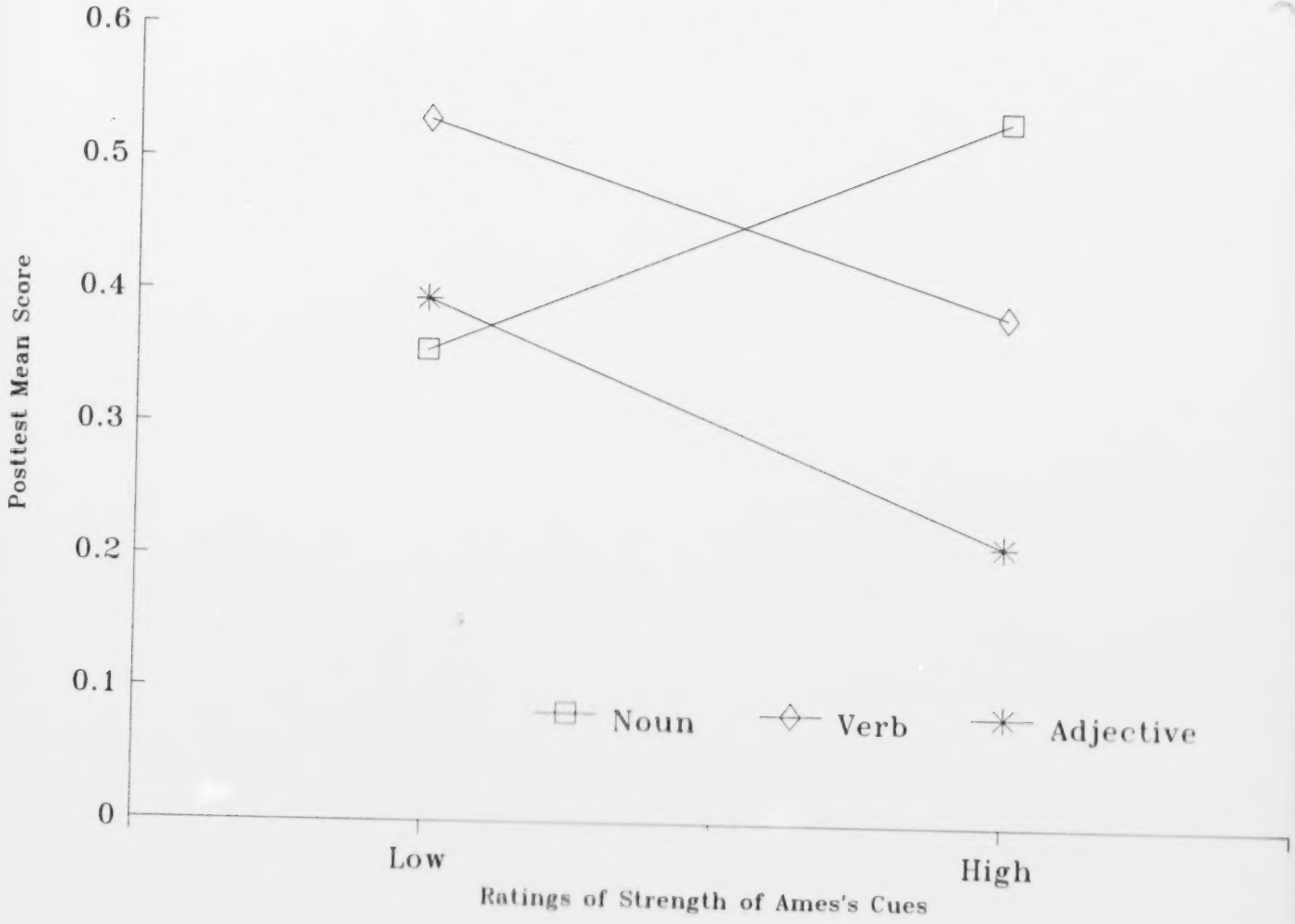
Low
High
Ratings of Strength of Ames's Cues

Figure 3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Posttest Mean Score
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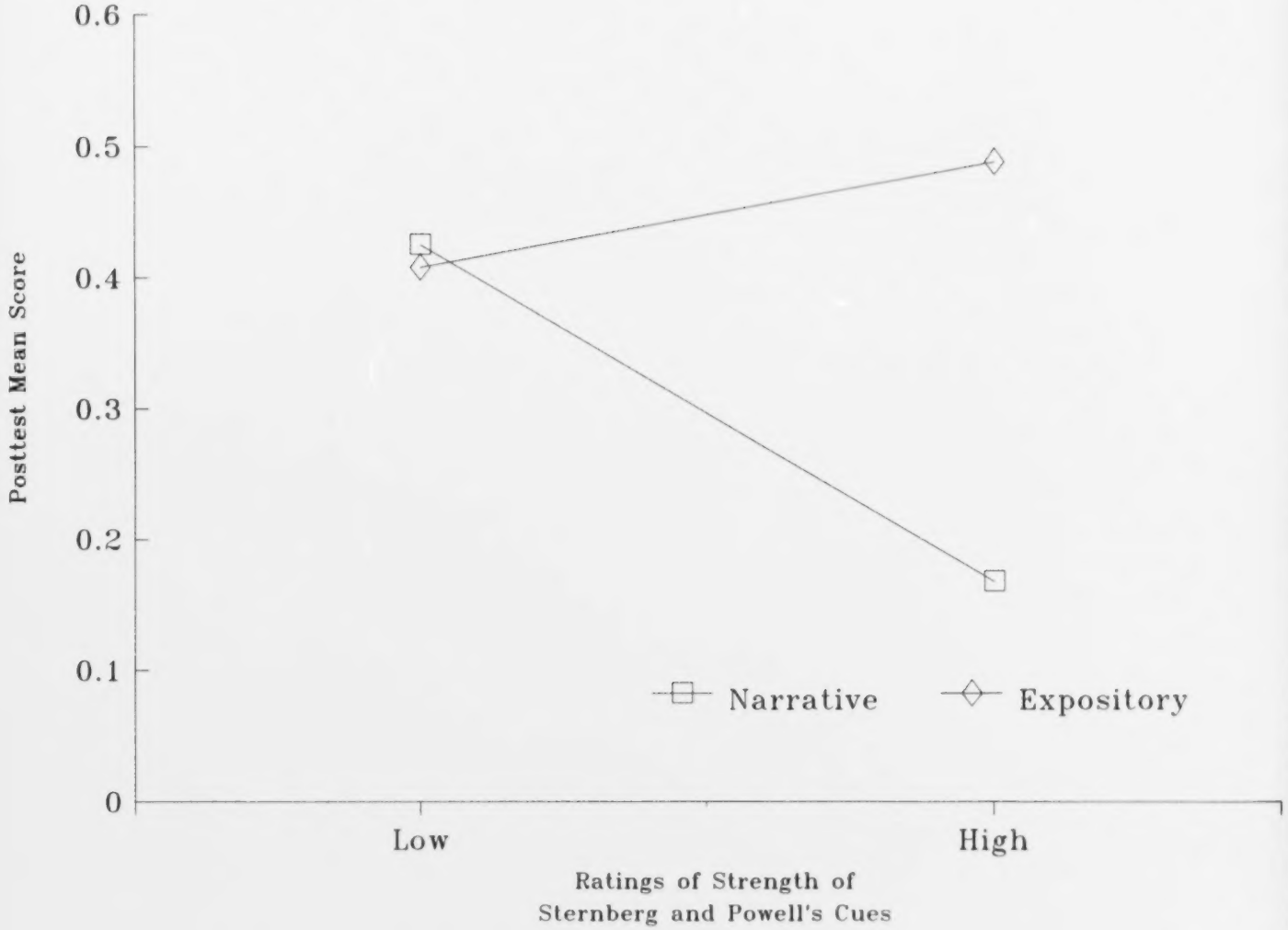
Ratings of Strength of Ames's Cues

Figure 4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